



LARGE LAMP

Application BULLETIN

file:

PAR & R LAMPS
QUARTZLINE
MERCURY
INCANDESCENT

Lamp Characteristics and Data

This publication summarizes the principal characteristics and performance data on the most popular General Electric PAR and R lamps. Because PAR and R lamps are complete light-control packages, and because they are offered in a wide variety of sizes and light distributions, the lamps are being employed in interior general lighting and in virtually every interior and exterior application where a directed beam of light is needed.

The principal advantages, besides convenience, of PAR and R lamps, can be summarized briefly: Built-in reflectors eliminate the need for labor to clean fixtures. Compactness makes for less conspicuous equipment. Long life further reduces maintenance. Three basic light sources are available: conventional filament, Quartzline® filament, and mercury vapor.



PAR LAMPS The bulbs of PAR lamps are made of heat-resistant glass ("hard" glass), pressed in molds which accurately form the contours of both reflectors and cover glasses. A thin layer of aluminum is vaporized on the inner surface of the reflector glass before the parts are assembled.

The method of lamp assembly permits relatively precise location of the filament with respect to the reflector. Most PAR reflectors are designed to produce rather narrow beams of light; the configuration of the cover glass modifies the light distribution: a lightly stippled finish serves to smooth the beams of spot lamps, while spread-lens patterns are used for floods.

The 150-watt PAR-38 flood with conventional filament is by far the most widely used of all the PAR and R types; its characteristics apply to many lighting fields. The PAR-38 spot and higher wattage PAR lamps are useful where higher intensities and other beam patterns are desired, most often in display lighting and building floodlighting.

Cool-Beam lamps are PAR lamps in which the vaporized aluminum reflector has been replaced by a special 20-layer thin-film coating of metallic salts. The Cool-Beam coating reflects light into the beam, but transmits the infrared (heat) wavelengths through the reflector sides (See diagram, page 5). Cool-Beam lamps are of great value wherever it is desirable to reduce radiant heat in the beam of light.



R LAMPS The bulbs of R lamps (or "reflector lamps") are blown on conventional bulb-making machinery. Most R bulbs are blown of non-heat-resistant ("soft") glass, but hard-glass R lamps are also manufactured.

In most R lamps the reflector surface is of pure vaporized silver; some types have aluminized reflectors. Control of beam spread is determined by the bulb shape and by the degree of frosting of the inner bulb surface. Spot lamps are frosted lightly; floods, heavily. Because there is inherently less control in bulb shape, in the frosting process, and in source positioning during lamp assembly, the beams of R lamps cannot be controlled as well as those of PAR lamps.

Besides the spot and flood lamps, three conventional filament R lamps are designed to have special wide-spread light distributions that do not "peak" on the lamp axis. These lamps, in R-52 and RB-52 shapes, are designed to provide uniform illumination in industrial lighting applications.

QUARTZLINE® PAR AND R LAMPS

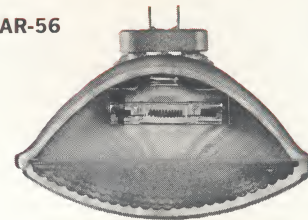
Since 1964 General Electric has offered to users the convenience of PAR and R lamps coupled with the advantages of Quartzline lamps. PAR and R Quartzline lamps, compared to conventional filament types, have these user benefits:

- higher initial light output per watt
- near-perfect lumen maintenance
- longer life, doubled in most cases
- in PAR types, more watts in a given bulb size for a bigger "package" of light.

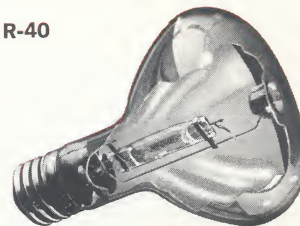
The illustrations at right show the "bulb-within-a-bulb" design of the PAR and R Quartzline lamps. The compact coiled-coil filament is sealed within an inner tube of quartz. The filament tube contains an iodine atmosphere. The outer bulb contains inert gases to protect filament tube parts from oxidation.

The lamps may be burned in any position. A continuous reaction between the iodine and tungsten evaporated from the filament returns the tungsten from the tube wall to the coils. As a result, lamp glass does not darken appreciably, and light output is near initial values throughout life.

PAR-56



R-40



MERCURY VAPOR PAR AND R LAMPS

Mercury vapor lamps are classified as high intensity discharge lamps. They produce light by vaporizing mercury within an electric discharge arc inside a quartz tube — instead of by electrically heating a tungsten filament as do incandescent lamps.

Mercury lamps produce approximately three times as much light initially as filament lamps, and maintain lumen output at 92% (mean) over their life. The average life of mercury lamps is 24,000 hours as compared to 4000 hours for Quartzline and 2000 hours for conventional filament. Current-limiting ballasts are required for mercury lamps (see GEA-7056 "Specifiers Guide for Mercury Lamp Ballasts").

PAR and R mercury lamps are made with hard glass, and outer bulbs are filled with nitrogen to maintain a nearly constant arc tube temperature. The glass also filters out most of the short-wavelength ultraviolet energy produced by the arc, but much of the long-wave ultraviolet (black light) is transmitted.

Conventional Filament PAR Lamps — 120 volts — 2000 hour rated life

WATTS ¹	BULB ²	BASE	ORDERING CODE	BEAM TYPE	BEAM SPREAD (Degrees) ³	APPROXIMATE		
						AVG. MAX. CP (Candelas) ⁴	INITIAL BEAM LUMENS	TOTAL LUMENS
75	PAR-38	Med. Skirted	75PAR/SP	Spot	30	3,500	340	675
75	PAR-38	Med. Side Prong	75PAR/3SP	Spot	30	3,500	340	675
75	PAR-38	Med. Skirted	75PAR/FL	Flood	60	1,350	475	675
75	PAR-38	Med. Skirted	75PAR38/2FL*	Flood	60	1,350	475	675
75	PAR-38	Med. Side Prong	75PAR/3FL	Flood	60	1,350	475	675
150	PAR-38	Med. Skirted	150PAR/SP	Spot	30	9,100	970	1,730
150	PAR-38	Med. Skirted	150PAR38/2SP*	Spot	30	9,100	970	1,730
150	PAR-38	Med. Side Prong	150PAR/3SP	Spot	30	9,100	970	1,730
150	PAR-38	Med. Skirted	150PAR/FL	Flood	60	3,500	1,250	1,730
150	PAR-38	Med. Skirted	150PAR38/2FL*	Flood	60	3,500	1,250	1,730
150	PAR-38	Med. Side Prong	150PAR/3FL	Flood	60	3,500	1,250	1,730
150	PAR-38	Med. Skirted	150PAR/WFL	Wide Flood	120	1,140	1,550	1,730
200	PAR-46	Med. Side Prong	200PAR46/3NSP	Narrow Spot	17 x 23	36,000	1,200	2,250
200	PAR-46	Med. Side Prong	200PAR46/3MFL	Med. Flood	20 x 40	10,500	1,300	2,250
300	PAR-56	Mog. End Prong	300PAR56/NSP**	Narrow Spot	15 x 20	70,000	1,800	3,840
300	PAR-56	Ext. Mog. End Prong	300PAR56/2NSP*	Narrow Spot	15 x 20	70,000	1,800	3,840
300	PAR-56	Mog. End Prong	300PAR56/MFL**	Med. Flood	20 x 35	24,000	2,100	3,840
300	PAR-56	Ext. Mog. End Prong	300PAR56/2MFL*	Med. Flood	20 x 35	24,000	2,100	3,840
300	PAR-56	Mog. End Prong	300PAR56/WFL**	Wide Flood	30 x 60	10,000	2,200	3,840
300	PAR-56	Ext. Mog. End Prong	300PAR56/2WFL*	Wide Flood	30 x 60	10,000	2,200	3,840
500	PAR-64	Ext. Mog. End Prong	500PAR64/NSP	Narrow Spot	13 x 20	104,000	3,000	6,500
500	PAR-64	Ext. Mog. End Prong	500PAR64/MFL	Med. Flood	20 x 35	35,000	3,300	6,500
500	PAR-64	Ext. Mog. End Prong	500PAR64/WFL	Wide Flood	35 x 65	11,000	3,400	6,500

¹ Use only in outlets approved for lamp wattage.

² Maximum bulb diameters are determined by multiplying the number following "PAR" by $\frac{1}{8}$ ". Thus, "PAR-38" is $4\frac{1}{2}$ " in diameter. Although bulbs are made of heat-resistant glass, breakage may result with PAR-46, -56, and -64 lamps if bulbs and lenses are not protected from rain, snow or liquid sprays.

³ Beam width at 10% of peak candlepower.

⁴ Average in central 5° cone for narrow spot and spot, central 10° cone for floods.

* Cool-Beam Lamps.

** Also available for some circuit voltages in the 220-240 range. Consult sales offices on back page. Light output values are somewhat lower.

Conventional Filament R Lamps — 120 volts¹ — 2000 hour rated life

WATTS ²	BULB ³	BASE	ORDERING CODE	BEAM TYPE	APPROXIMATE			
					BEAM SPREAD (Degrees) ⁴	INITIAL		
						AVG. MAX. CP (Candelas) ⁵	BEAM LUMENS	TOTAL LUMENS
30	R-20	Medium	30R20*	Flood	80	320	165	200
50	R-20	Medium	50R20*	Flood	90	575	390	430
75	R-30	Medium	75R30/SP*	Spot	50	2,600	390	860
75	R-30	Medium	75R30/FL*	Flood	130	415	750	860
150	R-40	Medium	150R/SP*	Spot	40	8,000	910	1,950
150	R-40	Medium	150R/FL*	Flood	110	1,100	1,680	1,950
300	R-40	Medium	300R/SP*	Spot	35	13,500	2,000	3,600
300	R-40	Medium	300R/SP/1**	Spot	35	13,500	2,000	3,600
300	R-40	Mogul	300R/3SP**	Spot	35	13,500	2,000	3,600
300	R-40	Medium	300R/FL*	Flood	115	2,200	3,350	3,600
300	R-40	Medium	300R/FL/1**	Flood	115	2,200	3,350	3,600
300	R-40	Mogul	300R/3FL**	Flood	115	2,200	3,350	3,600
500	R-40	Mogul	500R/3SP**	Spot	60	22,000	3,800	6,500
500	R-40	Mogul	500R/3FL**	Flood	120	4,700	5,900	6,500
500	R-52	Mogul	500R52*	High Bay	(See CP Distribution Curves)			7,850
750	R-52	Mogul	750R52*	High Bay				13,000
1000	RB-52	Mogul	1000RB52*	High Bay				18,000

¹ Most lamps are available for circuits from 220-240. Consult sales offices on back page. Light output values are somewhat lower.

² Use only in outlets approved for lamp wattage.

³ Maximum bulb diameters are determined by multiplying the number following "R" by $\frac{1}{8}$ ". Thus, "R-20" is $2\frac{1}{2}$ " in diameter. Although

some bulbs are made of heat-resistant glass, breakage may result if bulbs and lenses are not protected from rain, snow or liquid sprays.

⁴ Beam width at 10% of peak candlepower.

⁵ Average in central 5° cone for spot, central 10° cone for floods.

* Soft glass.

** Hard glass.

Quartzline PAR Lamps — 120 volts — 4000 hour rated life⁵

WATTS ¹	BULB ²	BASE	ORDERING CODE	BEAM TYPE	APPROXIMATE			
					BEAM SPREAD (Degrees) ³	INITIAL		
						AVG. MAX. CP (Candelas) ⁴	BEAM LUMENS	TOTAL LUMENS
250	PAR-38	Med. Skirted	Q250PAR38SP	Spot	24	34,000	1,600	3,120
250	PAR-38	Med. Skirted	Q250PAR38FL	Flood	60	6,000	2,400	3,120
500	PAR-56	Mog. End Prong	Q500PAR56NSP	Narrow Spot	15 x 32	90,000	3,500	7,000
500	PAR-56	Mog. End Prong	Q500PAR56MFL	Med. Flood	20 x 42	49,000	4,200	7,000
500	PAR-56	Mog. End Prong	Q500PAR56WFL	Wide Flood	34 x 66	18,000	5,600	7,000
1000	PAR-64	Ext. Mog. End Prong	Q1000PAR64NSP	Narrow Spot	14 x 31	160,000	8,500	17,000
1000	PAR-64	Ext. Mog. End Prong	Q1000PAR64MFL	Med. Flood	22 x 45	60,000	10,000	17,000
1000	PAR-64	Ext. Mog. End Prong	Q1000PAR64WFL	Wide Flood	45 x 72	27,000	13,500	17,000

¹ Use only in outlets approved for lamp wattage.

² Maximum bulb diameters are determined by multiplying the number following "PAR" by $\frac{1}{8}$ ". Thus, "PAR-38" is $4\frac{3}{4}$ " in diameter. Although bulbs are made of heat-resistant glass, breakage may

result if bulbs and lenses are not protected from rain, snow or liquid sprays.

³ Beam width at 10% of peak candlepower.

⁴ Average in central 5° cone for narrow spot and spot, central 10° cone for floods.

⁵ 3000 hours for 250-watt PAR-38.

Quartzline R Lamps — 120 volts

WATTS ¹	BULB ²	BASE	ORDERING CODE	RATED LIFE (Hours)	BEAM TYPE	APPROXIMATE			
						BEAM SPREAD (Degrees) ³	INITIAL		
							AVG. MAX. CP (Candelas) ⁴	BEAM LUMENS	TOTAL LUMENS
500	R-40	Mogul	Q500R40SP	4000	Spot	32	42,000	3,300	7,000
500	R-40	Mogul	Q500R40FL	4000	Flood	110	4,500	5,400	7,000
1000	R-60	Mogul	Q1000R60SP	3000	Spot	32	155,000	11,500	17,000
1000	R-60	Mogul	Q1000R60FL	3000	Flood	110	14,500	15,500	17,000

¹ Use only in outlets approved for lamp wattage.

² Maximum bulb diameters are determined by multiplying the number following "R" by $\frac{1}{8}$ ". Thus, "R-40" is 5" in diameter. Although bulbs are made of heat-resistant glass, breakage may result if

bulbs and lenses are not protected from rain, snow or liquid sprays.

³ Beam width at 10% of peak candlepower.

⁴ Average in central 5° cone for spot, central 10° cone for floods.

Low Voltage PAR Lamps — 5.5 and 6 volts¹

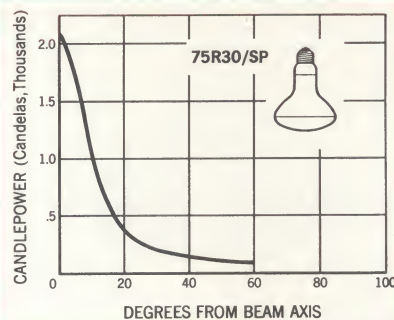
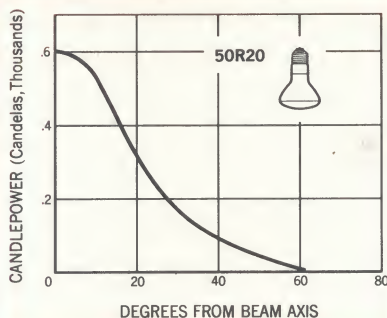
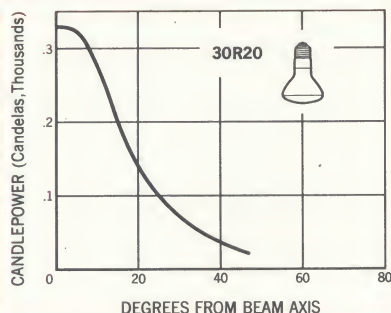
WATTS	BULB	BASE	ORDERING CODE	RATED LIFE (Hours)	BEAM TYPE	APPROXIMATE			
						BEAM SPREAD (Degrees)	INITIAL		
							AVG. MAX. CP (Candelas)	BEAM LUMENS	TOTAL LUMENS
25	PAR-36	Screw Terminal	25PAR36	1000	Spot	4.5 x 5.5	30,000	—	—
25	PAR-46	Screw Terminal	25PAR46	1000	Spot	4.5 x 5.5	55,000	—	—
120	PAR-64	Screw Terminal	120PAR	3000	Spot	5 x 9	180,000	—	—
120	PAR-64	Screw Terminal	120PAR/1	2000	Spot	5 x 9	200,000	—	—

¹ 25-watt lamps are designed for 5.5 volts; 120-watt lamps are designed for 6 volts.

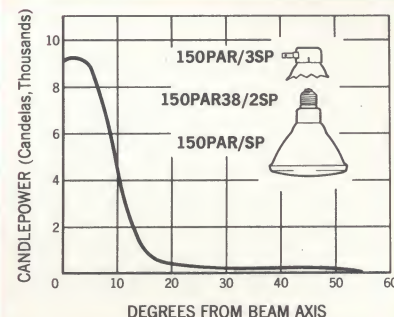
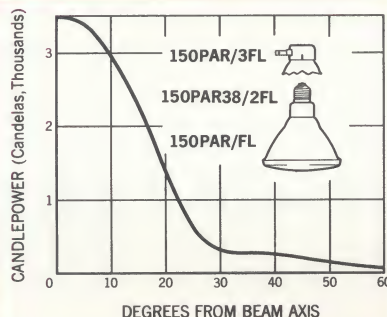
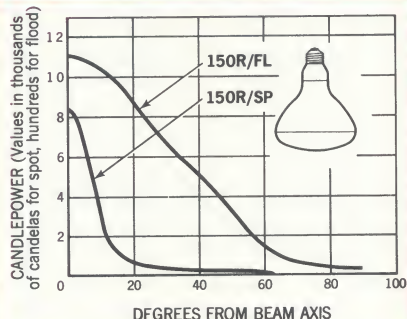
Approximate Initial Candlepower Distribution Curves

watts

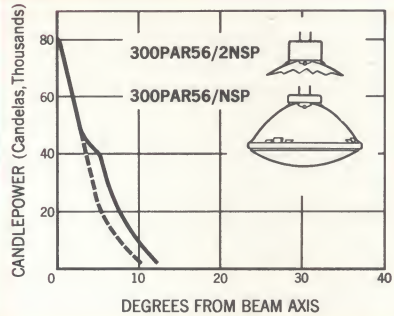
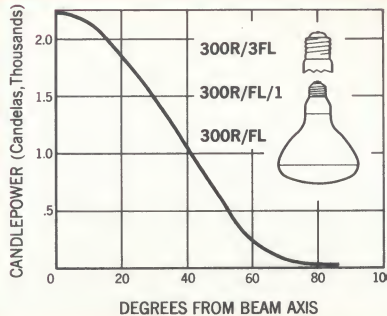
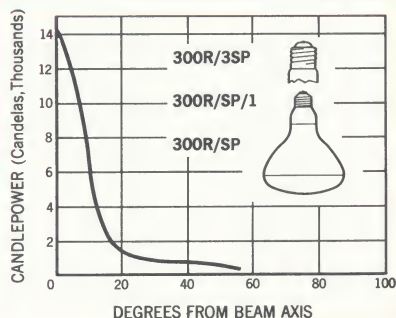
30
to
75



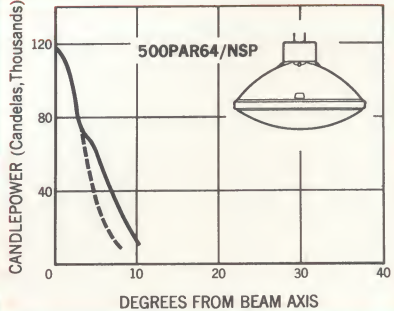
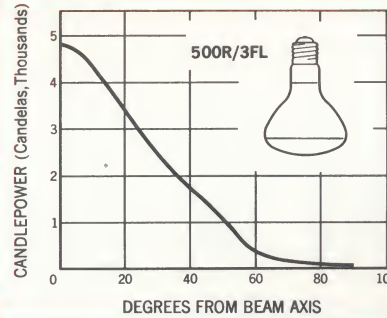
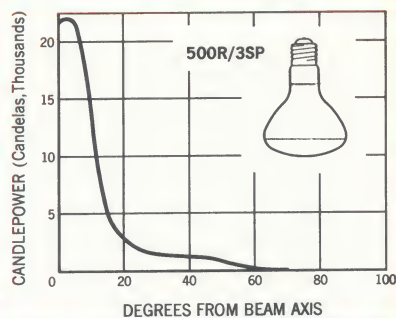
150
to
200



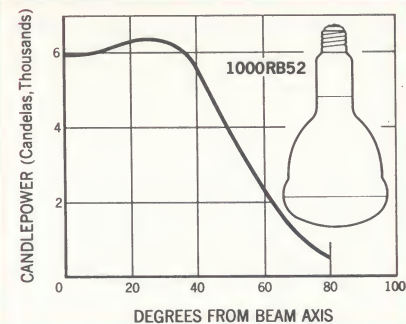
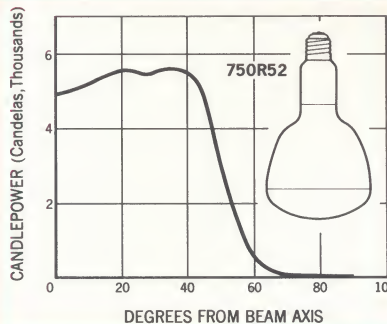
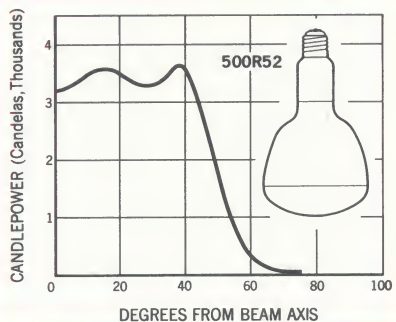
300



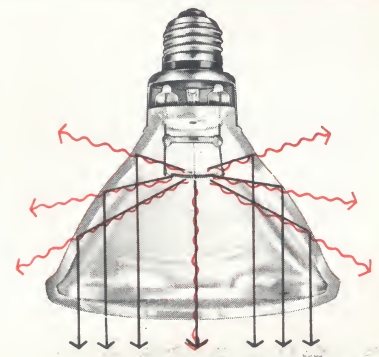
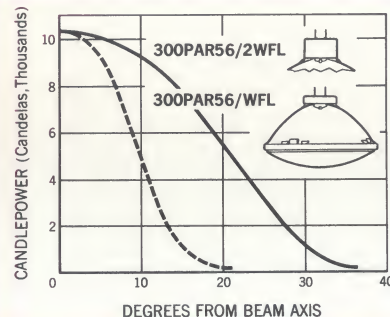
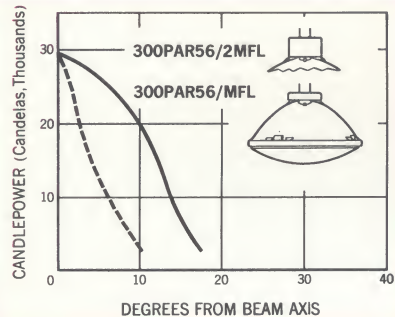
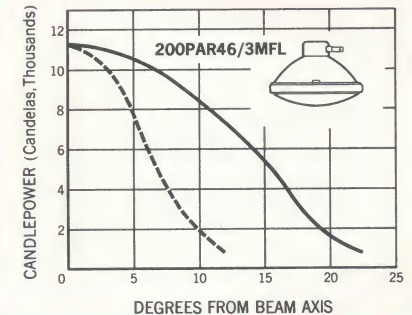
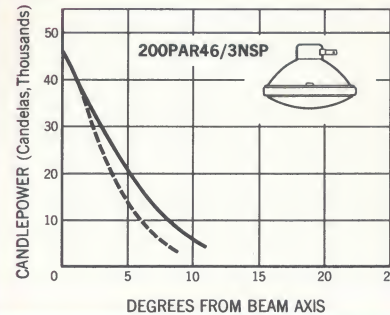
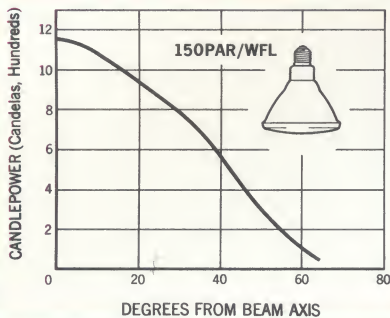
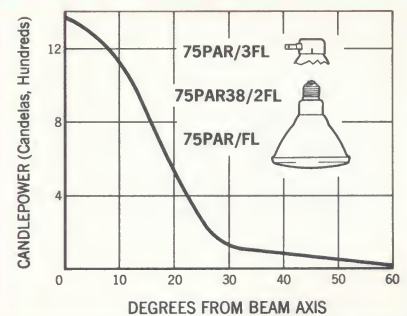
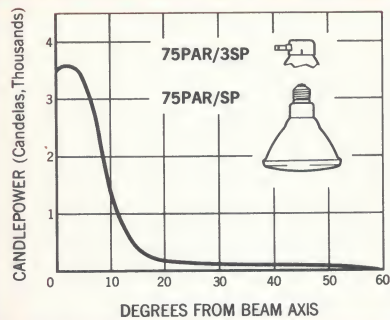
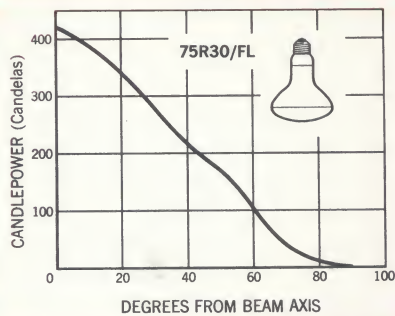
500



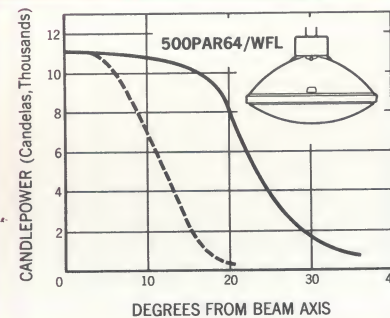
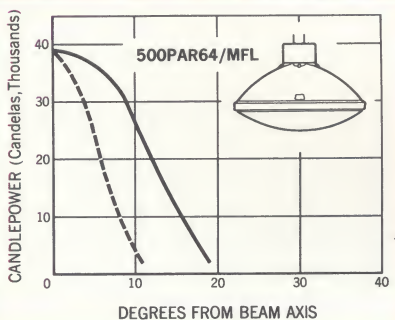
500
to
1000



for CONVENTIONAL FILAMENT G-E PAR and R Lamps



In a Cool-Beam lamp, a multi-layer coating on the inside of the reflector surface acts as a filter, passing infrared energy (heat) through its surface, but reflecting the visible energy (light) back into the light beam. Cool Beam lamps include the 75-watt PAR-38 flood, the 150-watt PAR-38 in either spot or flood, and the 300-watt PAR-56 in narrow spot, medium or wide flood beam patterns.



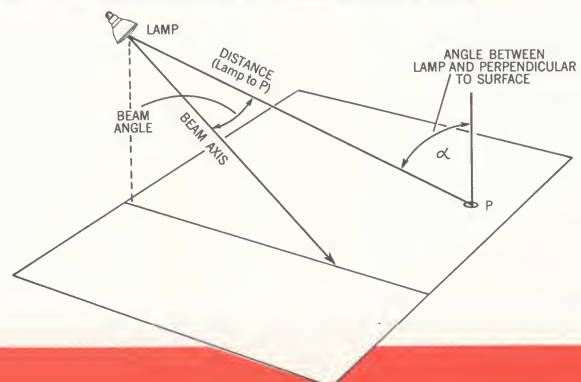
HOW TO USE CANDLEPOWER DISTRIBUTION CURVES TO CALCULATE ILLUMINATION

The curves on these pages can be used for point-by-point illumination calculations. The sketch illustrates a typical problem for calculating footcandles at some point P on a surface lighted by a PAR or R lamp. The footcandles on the surface at P are determined by the formula:

$$FC = \frac{\text{Candlepower}}{(\text{Distance})^2} \times \cosine \alpha$$

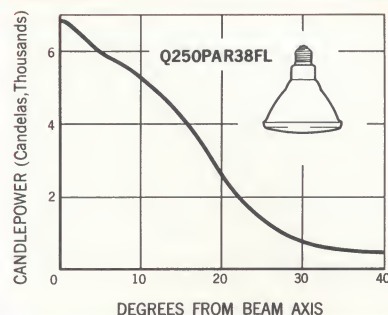
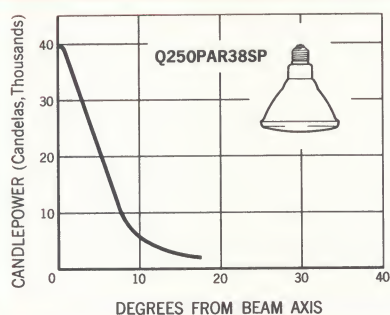
where:

- the candlepower is found from the curve for the appropriate lamp at the beam angle involved,
- the distance is measured from the lamp to P,
- and α is the angle at P between the lamp and a perpendicular to the surface.

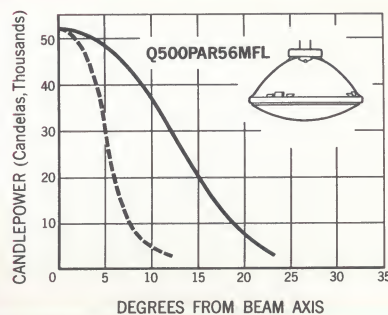
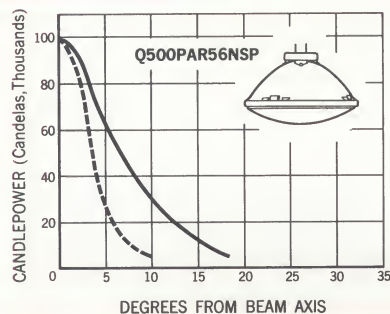


Approximate Initial Candlepower Distribution Curves

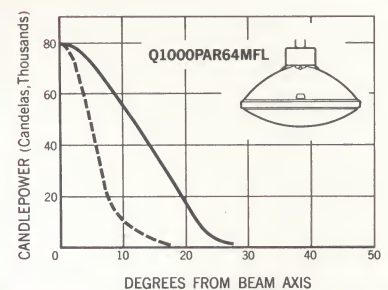
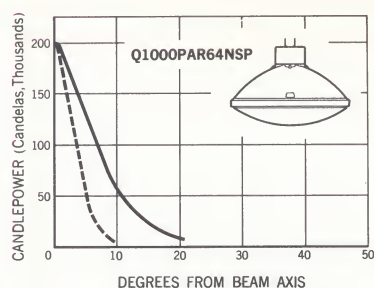
250 watt QUARTZLINE



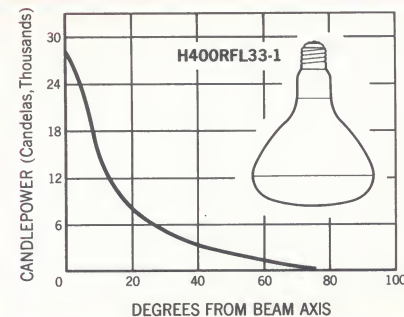
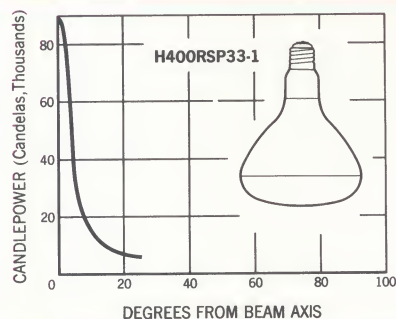
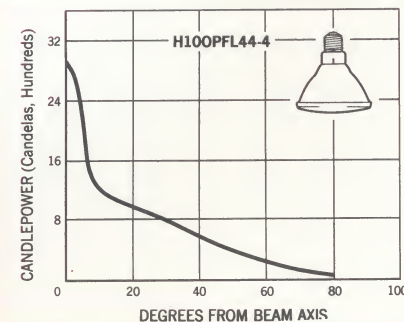
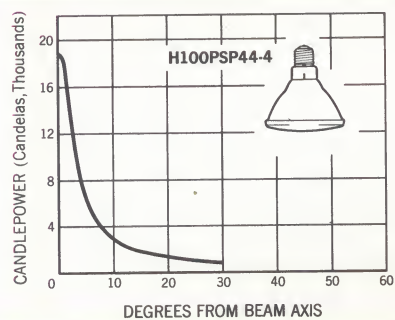
500 watt QUARTZLINE



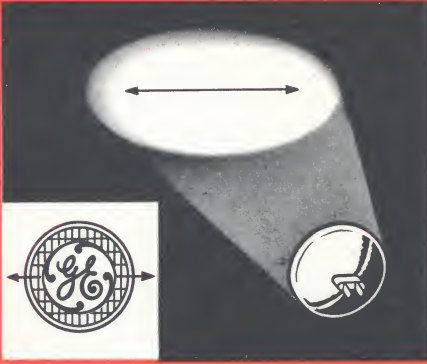
1000 watt QUARTZLINE



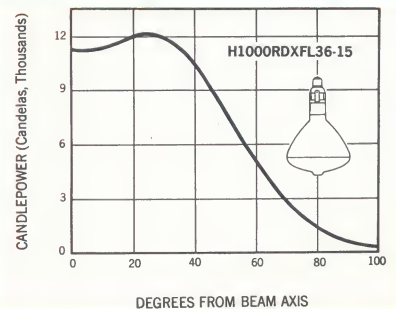
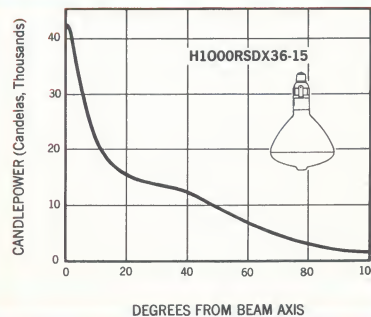
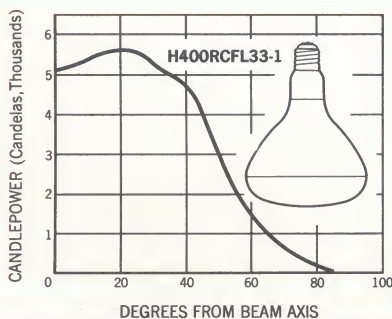
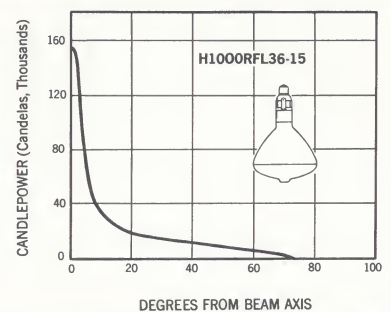
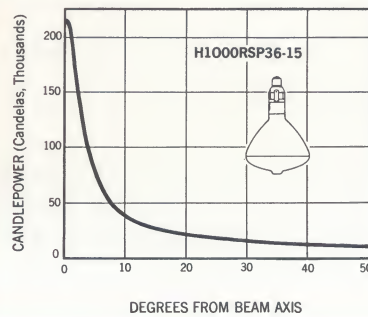
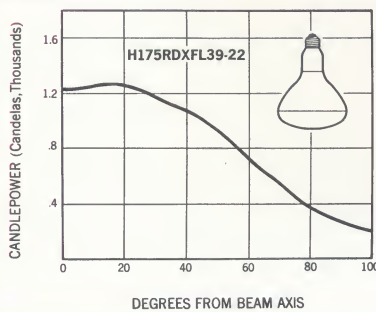
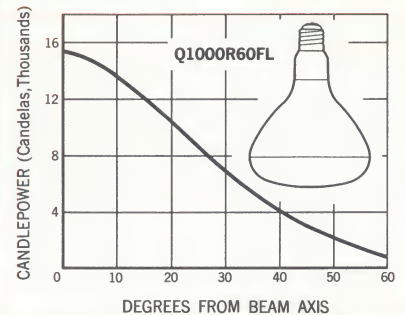
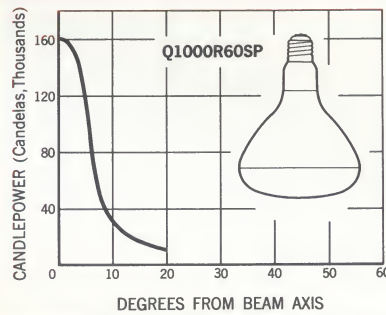
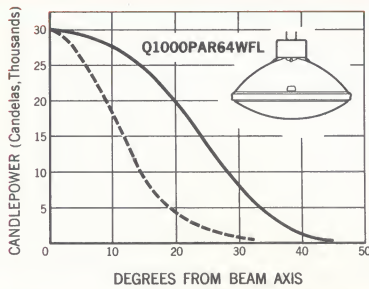
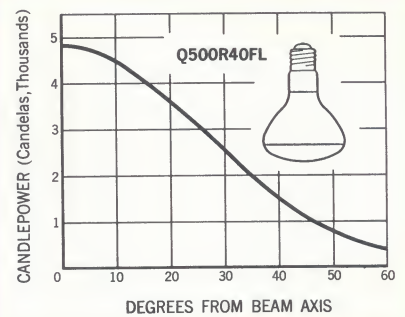
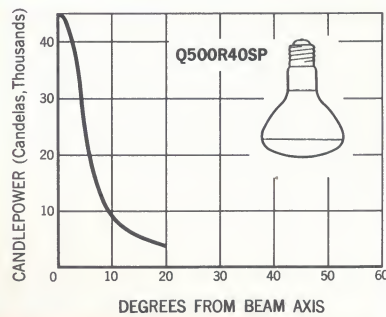
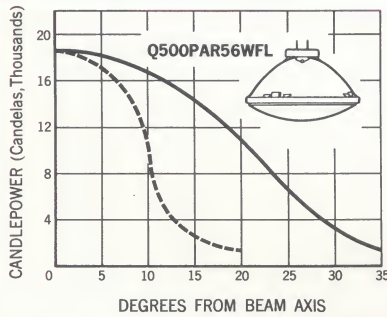
MERCURY 100 TO 1000 watts



for G-E PAR and R QUARTZLINE and MERCURY Lamps



The beams of PAR-46, PAR-56 and PAR-64 lamps, whether conventional filament or Quartzline filament, are oval in shape. In the candlepower distribution curves on these pages, the widest section of the oval for each lamp is represented by the solid line curves and the narrowest section by the dashed-line curves. The orientation of the wide axis of the beam with respect to the G-E monogram on the bulb face on each of the lamps is shown by the arrows in the sketches at the left. The beams of all other lamps in this brochure are approximately circular.



GENERAL ELECTRIC LARGE LAMP SALES AND SERVICE DISTRICT OFFICES

SALES DISTRICTS (To Obtain Sales and Technical Information)

SERVICE DISTRICTS (To Order Lamps and to Obtain Shipping Information. Local Warehouse Stocks maintained at these Points)

CITY	ZIP No.	Telephone No.	CITY	ZIP No.	Telephone No.
ALBANY, N. Y.	879 Madison Ave.	12208	Buffalo Serv. Dist., 98 Hydraulic St., Buffalo, N.Y.	14210	856-0800
ATLANTA, GA.	120 Ottley Drive	30324	120 Ottley Drive—P.O. Box 13917	30324	875-0921
BALTIMORE, MD.	1401 Parker Rd.—P.O. Box 7427	21227	1401 Parker Rd.—P.O. Box 7427	21227	242-5700
BOSTON, MASS.	50 Industrial Pl., Newton Upper Falls, Mass.	02164	50 Industrial Place, Newton Upper Falls, Mass.	02164	332-6200
BUFFALO, N. Y.	625 Delaware Ave.	14202	98 Hydraulic St.	14210	856-0800
CHARLOTTE, N. C.	1001 Tuckaseegee Rd.—P.O. Box 2144	28201	1001 Tuckaseegee Rd.—P.O. Box 2144	28201	376-6585
CHICAGO, ILL.	550 West Jackson Blvd.	60606	4201 So. Pulaski Rd.	60632	254-6161
CINCINNATI, OHIO	990 Nassau St.	45206	49 Central Ave.	45202	421-6810
CLEVELAND, OHIO	12910 Taft Ave.—P.O. Box 2494	44112	12910 Taft Ave.—P.O. Box 2422	44112	266-4404
DALLAS, TEXAS	6500 Cedar Springs Rd.	75235	6500 Cedar Springs Rd.—P.O. Box 35425	75235	351-3725
DENVER, COLO.	6501 Stapleton Dr., N.	80216	6501 Stapleton Dr., N.	80216	388-4611
DETROIT, MICH.	15135 Hamilton Ave.	48203	15135 Hamilton Ave.	48203	883-0200
HOUSTON, TEXAS	4219 Richmond Ave.—P.O. Box 22286	77027	5534 Armour Dr.—P.O. Box 18265	77023	923-2549
INDIANAPOLIS, IND.	2511 E. 46 St.	46205	Cincinnati Serv. Dist., 49 Central Ave., Cincinnati, O.	45202	421-6810
N. KANSAS CITY, MO.	535 East 14th Ave.	64116	535 East 14th Ave.	64116	471-0123
LOS ANGELES, CALIF.	2747 South Malt Ave.	90022	2747 South Malt Ave.	90022	723-2541
MEMPHIS, TENN.	2011 So. Latham St.	38109	2021 So. Latham St.	38109	948-2642
MIAMI, FLA.	Florida Sales District—P.O. Box 5147	33605	1340 N.W. 74th St.—P.O. Box 47-796	33147	757-8481
MILWAUKEE, WIS.	815 N. 26th Street, Tampa, Fla.	53201	8100 West Florist Ave.—P.O. Box 299	53201	462-3860
MINNEAPOLIS, MINN.	8100 West Florist Ave.—P.O. Box 299	55413	500 Stinson Blvd.	55413	331-4050
NEWARK, N. J.	500 Stinson Blvd.	07041	133 Boyd St.	07103	824-5200
NEW HAVEN, CONN.	25 East Willow Street, Millburn, N. J.	06510	N.Y. Serv. Dist., 75-11 Woodhaven Blvd., Glendale, N.Y.	11227	896-6000
NEW ORLEANS, LA.	135 College St.	70121	4800 River Rd.—P.O. Box 10236	70121	835-6421
NEW YORK, N. Y.	4800 River Rd.—P.O. Box 10236	10017	75-11 Woodhaven Blvd., Glendale, N.Y.	11227	896-6000
OAKLAND, CALIF.	219 East 42 Street	94603	999-98th Ave.	94603	569-3422
PHILADELPHIA, PA.	999-98th Ave.	19406	Rt. 202 at Expressway, P.O. Box 299	19406	688-5900
PITTSBURGH, PA.	Rt. 202 at Expressway, P.O. Box 299	15219	King of Prussia, Pa.	15219	471-9050
PORTLAND, ORE.	238 W. Carson St.	97210	2800 N.W. Nela St.	97210	223-2101
RICHMOND, VA.	2800 N.W. Nela St.	23226	Baltimore Serv. Dist., P.O. Box 7427, Baltimore, Md.	21227	242-5700
SEATTLE, WASH.	1510 Willow Lawn Drive, P.O. Box 8627	98134	2400 Sixth Ave., South	63132	429-6930
ST. LOUIS, MO.	2400 Sixth Ave., South	63132	1530 Fairview Ave.	33605	248-4174
TAMPA, FLA.	1530 Fairview Ave.	33605	815 North 26th St.—P.O. Box 5147	33605	248-4174

6-12-68

In addition to the Sales District Headquarters cities listed above, GE Lamp Salesmen are resident in 93 other cities. Consult your telephone directory under General Electric Company Lamp Division.

General Offices: Nela Park, Cleveland, Ohio 44112